Remarks

Claims 1, 2, 3 – 9, and 13-15 remain in the application.

The examiner objects to the drawings because FIGS. 1-5 have shades that make the line and outlines unclear. Substitute drawings are submitted herewith which attempt to eliminate these problems. The drawings have been renumbered thus necessitating corresponding changes to the description. Applicants' attorney is willing to discuss the adequacy of the drawings and to make further changes to them.

The examiner rejects claims 4-7 under 37 CFR 1.75(c) for permitting other than alternative dependencies. Applicants disagree with this interpretation of "either of A and B" but to avoid this unnecessary issue, the dependency language has been amended to conform with one of the acceptable wording of MPEP 608.01(n)(A).

The examiner provisionally rejects claims 1 and 2 for obviousness-type double patenting over claims 1, 4, and 28 of co-pending application 10/505,051. The examiner is requested to withdraw the provisional ODP rejection. The present application relates to a light-emitting diode while 10/505,051 relates to a field-effect transistor. Although both are light-emitting elements, the present diode differs from the field-effect transistor of the copending application in structure and operation and one is not obvious over the other. Junctions of the source and drain with the gate of the field effect transistor of claim 1 of 10/505,051 are inherently designed to be switchable to a strong barrier to prevent conduction across the gate in the off-state of the transistor. In contrast, the diode of claim 1 is not switchable to the off-state but must have a non-barrier junction. Both claim 1 of 10/505,051 and claim 1 of the present application have source and drain electrodes but only 10/505,051 has a gate region with separate gate electrode. It is not obvious to remove the gate electrode from Claim 1 of 10/505,051. A diode is not an obvious variant of a transistor since the transistor gate provides control unavailable in a diode. No reasonable mechanic would use a transistor as a diode. In any case, this is a provisional rejection and should be held in abeyance until the issuance of 10/505,051.

The examiner rejects claims 11 and 13-15 under 35 U.S.C. §112, ¶1 for failing to comply with the written description requirement, in particular, a uniform composition of the light-emitting layer. This term has been changed to "continuous". This language is supported in FIG. 1 as described at page 5, lines 5-19, which shows a continuous and uninterrupted layer 13 is a light-emitting layer.

The examiner has rejected claims 1-2, 4-9, and 11-12 under 35 U.S.C. §112, ¶2 for indefiniteness because, he states, "non-barrier junction" is an uncommon term. However, Applicants have used and adequately defined the term at page 23, lines 13-26 and Applicants are entitled to be their own lexicographer. In the present application, ambipolar semiconductor material means that neither the injected electrons nor holes be subject to a potential barrier preventing their injection, that is, a device with non-barrier junctions. A non-barrier junction can be formed by, in the case of the n-electrode, making "the work function of the n-electrode ... lower than the conduction band edge energy of the ambipolar inorganic semiconductor and, in the case of the p-electrode making "the work function of the p-electrode ... higher than the conduction band energy of the ambipolar inorganic semiconductor" (page 23, line 26 to page 24, line 3), That the no-barrier junction can be formed in this way is a basic point in aligning the bands and in the device design and the effect can be exploited by the ordinary mechanic in the art.

The examiner seems to state that the specification fails to enable the formation of the non-barrier junction because it does not include a description of alleviating all effects that would detract from the non-barrier junction. However, these additional factors can be alleviated by known methods in the art once their deleterious effects have been described, as they have been in the present application. The dominant factor of the formation of the barrier at the junction between a semiconductor and its electrode is whether or not there is a function having improperly aligned semiconductor bands and electrode work functions. The other factors such as defect density or impurity concentration at the interface are subsidiary issues and not necessarily required in describing and enabling the present invention.

However, to simplify the problem, the claimed non-barrier junction in claim 1 has been

amended to be followed by the result that the non-barrier junctions are such that both the ambipolar semiconductor transports both injected holes and electrons as supported in the cited passage and following. Claim 13 has been amended for a similar requirement on the ambipolar material.

Claim 13 has been amended to require that the light-emitting layer both contacts two electrodes and consisting of ambipolar material conducting both injected holes and electrons.

New base claim 17 avoids the barrier issue by directly reciting the work function requirements.

The examiner has rejected claims 1-2, 7-9, and 11-15 under 35 U.S.C. §102(b) as being anticipated by Mensz (U.S. patent 5,422,902). The examiner seems to state that all semiconductors inherently ambipolar since they all transport electrons and holes. The examiner's statement is contrary to the ordinary meaning of the term ambipolar which requires that majority carriers of both types be transported in the ambipolar material, not majority and minority carriers of the two types. No prior art has been cited for the examiner's position that all semiconductors are ambipolar. On the contrary, most semiconductor materials are described as being either p-type or n-type, that is either hole conducting or electron conducting.

However, to simplify the problem, the ambipolar semiconductor material has been amended to require that it transports holes and electrons injected from the respective electrodes. Electrodes inject majority carriers, not minority carriers. Mensz does not describe in much detail the injection of carriers from his electrodes and does not describe the transport of minority carriers, but he certainly fails to support the position that his two ohmic contacts inject holes and electrons respectively. In the normal majority/minority carrier device, one electrode injects majority carriers and the other electrode drains the majority carriers.

Further, it is not seen that Mensz's quantum well transport both electrons and holes. Quantum wells are generally formed in either the conduction band or the valence band and capture respectively electrons or holes. Mensz does not describe the difficult structure of aligned electron wells in the conduction band and hole wells in the valence band. No art has been cited for such a structure. Yet further, Mensz does not even describe two types of carriers and it is

believed that his quantum well laser does not require the transport of both types of carriers. Mensz's barriers plainly do not conduct both types of carriers since they would then not act as barriers for the included quantum well.

Amended claim 13 requires that the light-emitting layer consists of ambipolar semiconductor material conducting both the injected holes and electrons. Mensz's barriers plainly do not conduct both types of carriers since they would then not act as barriers for the carriers confined in his quantum wells. If Mensz's barriers would conduct both holes and electrons, they would not serve as barriers, thus defeating Mensz's desired quantum well structure.

The examiner has rejected claims 4-6 under 35 U.S.C. §103(a) as being obvious over Mensz. These claims depend from claims believed to be in allowable form and should therefore also be allowable. Further, these claims have been amended to avoid the process language but only the structure which may result from diffusion or any other process. Mensz's electrodes are not formed of the same ambipolar material as that of the light-emitting layer, as required by these claims, but is instead a different possibly ambipolar material.

The Commissioner is authorized to charge deposit account 50-0636 any extra claim or extension fees or other required fee or credit thereto any over payment.

In view of the above amendments and remarks, early consideration and allowance of all claims are respectfully requested. If the Examiner believes that a telephone interview would be helpful, he is invited to contact the undersigned attorney at the listed telephone number, which is on California time.

Respectfully submitted,

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